



LAND USE APPLICATION FORM

Type I (OCMC 17.50.030.A)

- ☐ Compatibility Review
- ☐ Lot Line Adjustment
- ☐ Non-Conforming Use Review
- ☐ Natural Resource (NROD) Verification
- ☐ Site Plan and Design Review
- ☐ Extension of Approval

Type II (OCMC 17.50.030.B)

- ☐ Detailed Development Review
- ☐ Geotechnical Hazards
- ☐ Minor Partition (<4 lots)
- ☐ Minor Site Plan & Design Review
- ☐ Non-Conforming Use Review
- ☐ Site Plan and Design Review
- ☐ Subdivision (4+ lots)
- ☐ Minor Variance
- ☐ Natural Resource (NROD) Review

Type III / IV (OCMC 17.50.030.C)

- ☐ Annexation
- ☐ Code Interpretation / Similar Use
- ☐ Concept Development Plan
- ☐ Conditional Use
- ☐ Comprehensive Plan Amendment (Text/Map)
- ☐ Detailed Development Plan
- ☒ Historic Review
- ☐ Municipal Code Amendment
- ☐ Variance
- ☐ Zone Change

File Number(s): _____

Proposed Land Use or Activity: Installation of solar panels on a residential roof.

Project Name: Poppino Solar Install Number of Lots Proposed (If Applicable): 1

Physical Address of Site: 720 11th St, Oregon City, Oregon, 97045

Clackamas County Map and Tax Lot Number(s): 22E31AA06700 / 00570885

Applicant(s):

Applicant(s) Signature: Dustin Davidson

Applicant(s) Name Printed: Dustin Davidson Date: 03 / 25 / 2024

Mailing Address: 44 E 800 N, Orem, Utah, 84057

Phone: (385) 396-4478 Fax: _____ Email: permits@ionsolar.com

Property Owner(s):

Property Owner(s) Signature: Teri Poppino

Property Owner(s) Name Printed: Teri Poppino Date: 03 / 25 / 2024

Mailing Address: 720 11th St, Oregon City, Oregon, 97045

Phone: (971) 930-0074 Fax: _____ Email: turretmoon@gmail.com

Representative(s):

Representative(s) Signature: _____

Representative (s) Name Printed: _____ Date: _____

Mailing Address: _____

Phone: _____ Fax: _____ Email: _____

All signatures represented must have the full legal capacity and hereby authorize the filing of this application and certify that the information and exhibits herewith are correct and indicate the parties willingness to comply with all code requirements.

City of Oregon City
Historic Review for Solar Panel Installations on a Historic Structure

Project Location:

720 11th St, Oregon City, Oregon, 97045. Taxlot #: 22E31AA06700. Parcel #: 00570885.

Project Description:

We are seeking approval to install solar panels at 720 11th St. The proposed solar system is roof mounted consisting of 9 panels (191.7 sq ft) and will cover 12.42% of the roof surface.

Compliance with Oregon City Historic Review Board Policy #12: Solar Technology

Solar technology that meets the criteria in the list below may be utilized on historic properties through staff review. Any proposal that deviates from this policy shall be considered by HRB.

- *Sloped roof location: Solar panels are permitted on secondary facades of historic buildings and on accessory structures*

In our proposed solar system we do not meet this requirement. The solar panels are visible from the top of Jefferson Street and 11th Street.

- *Design: Panels on sloped roofs shall project five inches or less from the roof surface and be installed flat; they shall not alter the slope of the roof.*

In our proposed solar system the solar panels will be flush mounted 5 inches above the roof surface. The panels and hardware will not increase the roof height or alter the slope of the roof.

- *Color: Panels and mounting systems shall be the same color as established roof materials. Mechanical equipment associated with the photovoltaic system shall be as unobtrusive as possible.*

In our proposed solar system the panels are solid black in color and the appearance of the hardware is minimal.

If the proposal does not comply with HRB Policy 12, please explain why deviation from the policy is necessary in this case. Please include any site-specific or structure-specific challenges:

In our proposed solar system we deviated from HRB Policy 12 because the homeowner is interested in investing in green energy but all sections of their roof are visible from the street. 7 out of the 9 panels will be installed on the backside of the roof visible from the top of Jefferson Street. The other 2 panels will be installed on the right side of the roof visible from 11th Street.

Please explain how alternative configurations that would comply with HRB Policy 12 were explored, and were deemed inappropriate given the circumstances described below:

Because the homeowner's roof is visible from the street there is no configuration that would meet HRB Policy 12. We will need Historica Review Board approval in order to proceed.

Please explain how this project represents a satisfactory alternative to compliance with HRB Policy 12.

Our proposed solar project represents a good alternative to HRB Policy 12 because it aligns with the overall preservation goals despite not strictly adhering to the roof location requirement. The installation will be done in a way that the solar panels will not detract from the overall historic significance of the property. And our project will allow the homeowner to invest in green energy and prolong the support and continued use of the property.

House Photos



Front



Left Side



Back



Righ Side



Left Roof Sections - No panels will be installed on these roof sections.



Back Roof Section - 7 panels will be installed on this roof section.



Right Roof Section - 2 panels will be installed on this roof section.

AERIAL SITE VIEW



SCOPE OF WORK

INSTALLATION OF UTILITY INTERACTIVE PHOTOVOLTAIC SOLAR SYSTEM

3.78 kW DC & 2.61 kW AC PHOTOVOLTAIC SOLAR ARRAY

PV MODULES: (9) SILFAB SOLAR SIL-420 HC+

INVERTER(S): (9) ENPHASE IQ8PLUS-72-2-US

ROOF TYPE: COMPOSITION SHINGLE - 1 LAYER(S)

PV MOUNTING HARDWARE: ECOFASTEN CLICKFIT STANDARD

SHEET LIST

G-1	COVER SHEET
V-2	SITE PLAN (AD. LIB)
S-3	ROOF PLAN
S-4	STRUCTURAL DETAILS
S-4.1 - 4.2	ROOF CROSS SECTION
S-5	STRUCTURAL CALCULATIONS & NOTES
E-6	ELECTRICAL DETAILS (LINE DIAGRAM)
E-7	ELECTRICAL CALCULATIONS & NOTES
E-8	ELECTRICAL LOAD CALCULATIONS (AD. LIB)
E-9	ELECTRICAL LABELS & LOCATIONS
E-10	ELECTRICAL DIRECTORY PLACARD (AD. LIB)

JURISDICTION CODES AND STANDARDS

GOVERNING CODES

I. ALL WORK SHALL COMPLY WITH:

2021 OREGON ELECTRICAL SPECIALTY CODE (OESC)

2022 OREGON STRUCTURAL SPECIALTY CODE (OSSC)

2021 OREGON RESIDENTIAL SPECIALTY CODE (ORSC)

2018 INTERNATIONAL FIRE CODE (IFC)

2021 OREGON PLUMBING SPECIALTY CODE

AND ALL STATE AND LOCAL BUILDING, ELECTRICAL, AND PLUMBING CODES.

SITE CLASSIFICATION NOTES, OSHA REGULATION

OCCUPANCY CLASS: SFR

CONSTRUCTION CLASS: V-B

ZONING TYPE: RESIDENTIAL

- I. A LADDER SHALL BE IN PLACE FOR INSPECTION IN COMPLIANCE WITH OSHA REGULATIONS.
2. MODULES HAVE AN ANTI-REFLECTIVE COATING TO PREVENT GLARE
3. FOR PROJECTS SUBMITTED FOR PRESCRIPTIVE REVIEW, ROOF ATTACHMENTS SHALL BE SPACED NO GREATER THAN 24" ON CENTER IN ANY DIRECTION WHERE LOCATED WITHIN 3' OF A ROOF EDGE, HIP, EAVE, OR RIDGE OSSC 3III.3.5.3 ITEM 3.2
- JUNCTION BOXES UNDER PV ARRAY SHALL BE INSTALLED TO BE CONSIDERED ACCESSIBLE BY OESC 690.34

ELECTRICAL CRITERIA, NOTES

TEMPERATURE SOURCE: ASHRAE

WEATHER STATION: AURORA STATE AP

EXTREME MIN. TEMPERATURE: -5

ASHRAE 0.4% HIGH TEMP: 37

- I. DRAWINGS HAVE BEEN DETAILED ACCORDING TO UL LISTING REQUIREMENTS.
2. TERMINALS AND LUGS WILL BE TIGHTENED TO MANUFACTURER TORQUE SPECIFICATIONS (WHEN PROVIDED) IN ACCORDANCE WITH NEC I10.I4(D) ON ALL ELECTRICAL.
3. PV MODULE CERTIFICATIONS WILL INCLUDE UL1703, IEC61646, IEC61730.
4. CONDUIT AND WIRE SPECIFICATIONS ARE BASED ON MINIMUM CODE REQUIREMENTS AND ARE NOT MEANT TO LIMIT UP-SIZING AS REQUIRED BY FIELD CONDITIONS.
5. PROPER ACCESS AND WORKING CLEARANCE AROUND EXISTING AND PROPOSED ELECTRICAL EQUIPMENT WILL BE PROVIDED AS PER SECTION [NEC I10.26].
6. WHERE PV CABLES ON ROOFTOP WOULD OTHERWISE BE EXPOSED TO PHYSICAL DAMAGE, 3/4" EMT SHALL BE USED TO PROTECT CABLES

STRUCTURAL CRITERIA, NOTES

DESIGN LOAD STANDARD: ASCE 7-16

WIND EXPOSURE CATEGORY: C

WIND SPEED (3-SEC GUST): 97 MPH

GROUND SNOW LOAD: 36 PSF

DESIGN ROOF SNOW LOAD: 25 PSF

SEISMIC DESIGN CATEGORY: D

SEISMIC RISK FACTOR: II



ION DEVELOPER

DAVID STANLEY CONRAD

C - ELECTRICAL CONTRACTOR

CI524



ION SOLAR

44 E 800 N

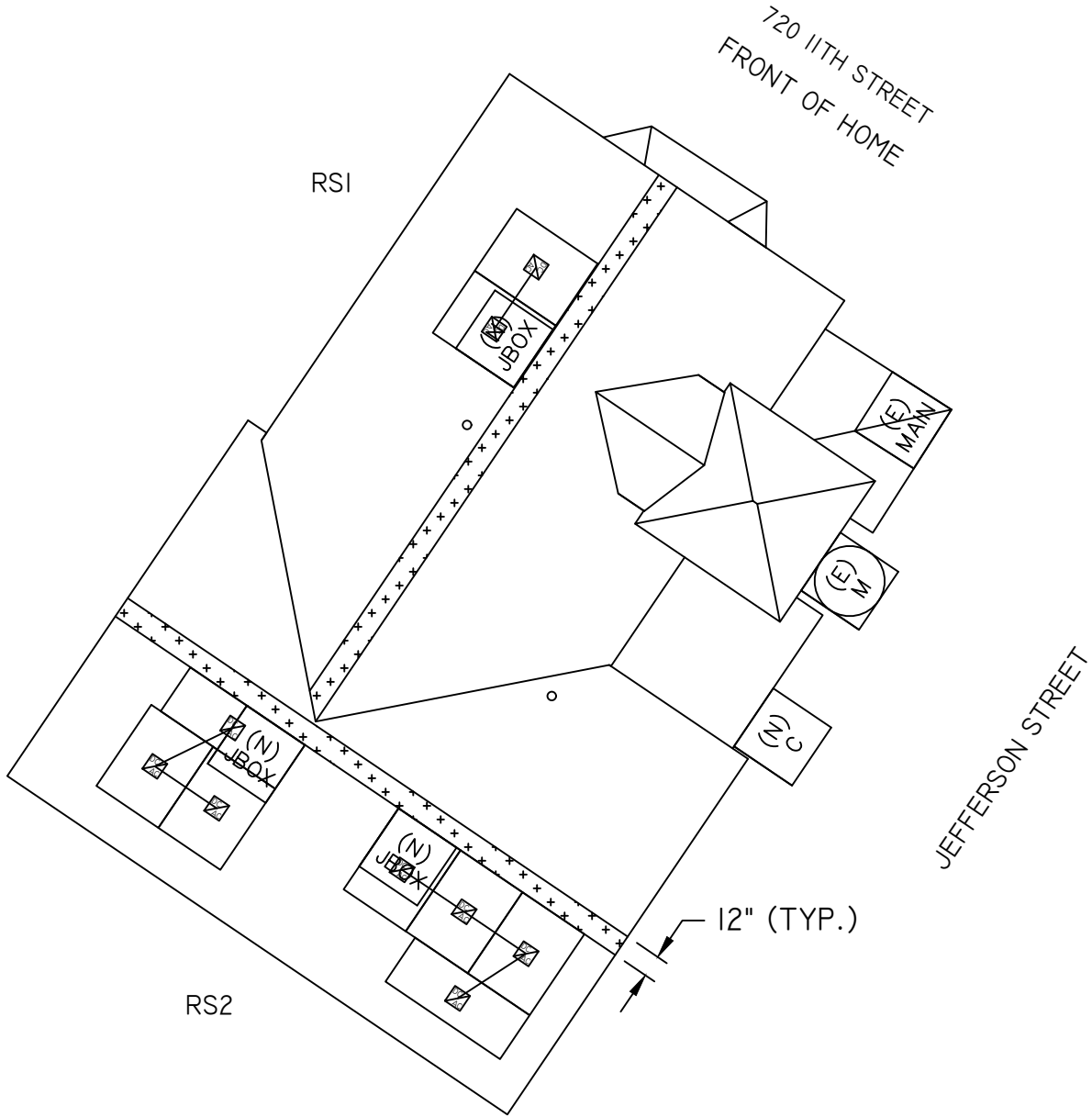
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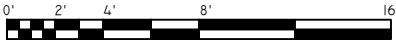
PROJECT ID		00CIDL
SITE OWNER		T G POPPINO
SITE ADDRESS		720 IITH STREET OREGON CITY, OREGON 97045
EQUIP.		(9) SILFAB SOLAR SIL-420 HC+ (9) ENPHASE IQ8PLUS-72-2-US
SYSTEM SIZE		3.78KW DC 2.61KW STC-AC, 3.373KW CEC-AC
PROJECT DESIGNER		NOAH MUNCK
DATE		22-FEB-2024
SHEET NAME		COVER SHEET
SHEET #	REV	
G-1		0

SITE NOTES:

FOR PROJECTS SUBMITTED FOR PRESCRIPTIVE REVIEW, ROOF ATTACHMENTS SHALL BE SPACED NO GREATER THAN 24" ON CENTER IN ANY DIRECTION WHERE LOCATED WITHIN 3' OF A ROOF EDGE, HIP, EAVE, OR RIDGE OSSC 3III.3.5.3 ITEM 3.2
JUNCTION BOXES UNDER PV ARRAY SHALL BE INSTALLED TO BE CONSIDERED ACCESSIBLE BY OESC 690.34
FOR ANY METER UPGRADES, ENSURE THAT THE UTILITY METER IS LOCATED WITHIN 10FT OF THE FRONT/STREET-SIDE OF THE HOUSE. PLEASE ADD A LABEL SHOWING THE DISTANCE FROM THE FRONT CORNER OF THE HOUSE.



SCALE: 1/8" = 1'-0"

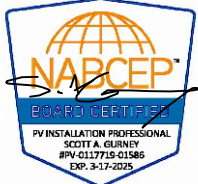


SYSTEM LEGEND

	(E) UTILITY METER / MAIN SERVICE PANEL		(N) PV COMBINER PANEL		(N) JUNCTION BOX		S# SUNEYE LOCATION
	(E) MAIN SERVICE PANEL		(N) PV LOAD CENTER		(N) AC DISCONNECT (VISIBLE-OPEN LOCKABLE LABELED DISCONNECT)		FIRE SETBACK
	(E) SUBPANEL		(N) PV PRODUCTION METER		(N) MICROINVERTER		(N) PV MODULE
			(N) DC-DC / STRING INVERTER		(N) DC DISCONNECT		STRUCTURALLY DISQUALIFIED

ROOF SECTION CRITERIA AND SPECIFICATIONS

ROOF SECTION	PV MODULE QTY	AZIMUTH	PITCH	TSRF
RS1	2	304	45	57%
RS2	7	214	45	81%



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00CIDL

SITE OWNER
T G POPPINO

SITE ADDRESS
720 11TH STREET
OREGON CITY, OREGON 97045

EQUIP.
(9) SILFAB SOLAR SIL-420 HC+
(9) ENPHASE IQ8PLUS-72-2-US

SYSTEM SIZE
3.78KW DC
2.61KW STC-AC, 3.373KW CEC-AC

PROJECT DESIGNER
NOAH MUNCK

DATE
22-FEB-2024

SHEET NAME
ROOF PLAN

SHEET #
S-3

REV
0

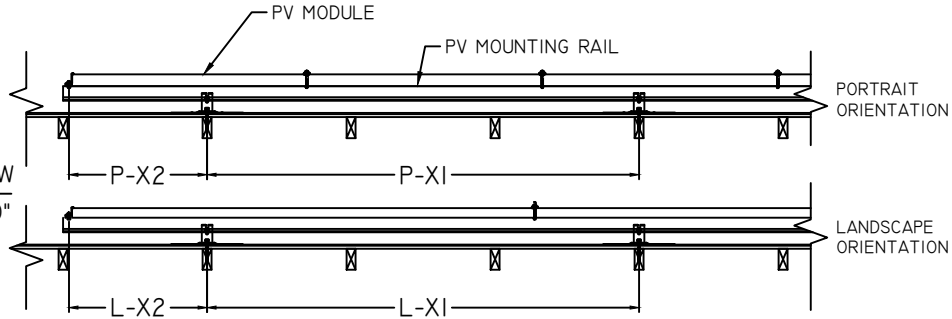
STRUCTURAL INSTALLATION SCHEDULE AND CRITERIA

ROOF MEMBRANE		SPAN AREA	TAG	SPAN
ROOF TYPE:	COMPOSITION SHINGLE	RAIL - PORTRAIT - MODULE ORIENTATION		
ROOF SHEATHING TYPE:	LUMBER AND PLYWOOD	X- SPACING	P-X1	48 IN. O.C. MAX.
		X-CANTILEVER	P-X2	15 IN. MAX.
		Y- SPACING	P-Y1	41.3 IN. MIN. - 45.3 IN. MAX.
		Y-CANTILEVER	P-Y2	15 IN. MIN. - 17 IN. MAX.
ARRAY PARAMETERS		RAIL - LANDSCAPE - MODULE ORIENTATION		
TOTAL ROOF AREA (SQ. FT.)	1544	X- SPACING	L-X1	48 IN. O.C. MAX.
TOTAL PV MODULE AREA (SQ. FT.)	191.7	X-CANTILEVER	L-X2	15 IN. MAX.
% PV MODULE ROOF COVERAGE	12.42%	Y- SPACING	L-Y1	21.1 IN. MIN. - 25.1 IN. MAX.
		Y-CANTILEVER	L-Y2	7.9 IN. MIN. - 9.8 IN. MAX.
PV RACKING				
RACKING:	ECOFASTEN CLICKFIT STANDARD			
RACKING TYPE:	RAIL			
STANDOFF:	CLICKFIT L-FOOT			
STANDOFF TYPE:	L-FOOT & FLASHING			
FASTENER:	5/16" X 3-1/2" ZINC PLATED STEEL LAG SCREW			

STRUCTURAL FRAMING					
ROOF SECTION	STRUCTURE TYPE	RAFTER / TC SIZE (IN)	RAFTER / TC SPACING (IN)	STRUCTURAL UPGRADE	UPGRADE SIZE & LENGTH (FT)
RS1	CONVENTIONAL FRAMING	2x4	16	NONE - SINGLE PLY (1x)	NONE
RS2	CONVENTIONAL FRAMING	2x4	16	NONE - SINGLE PLY (1x)	NONE

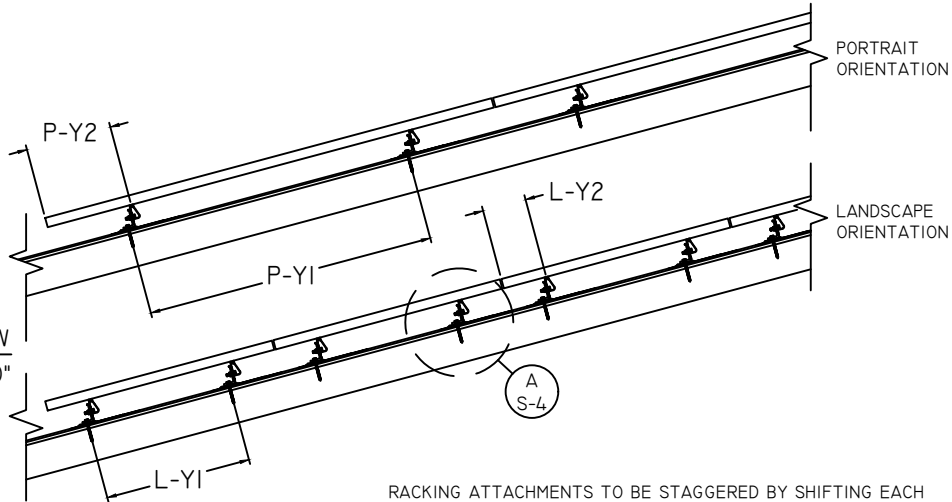
PV ARRAY DETAIL, FRONT VIEW

SCALE: 3/8" = 1'-0"

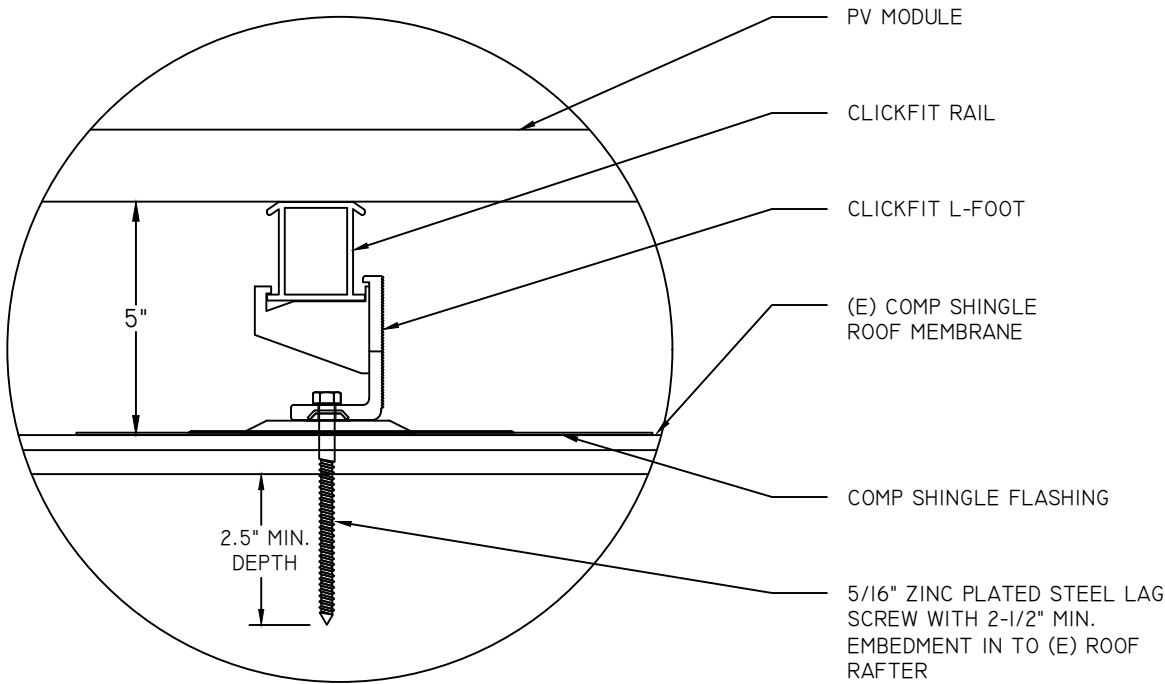


PV ARRAY DETAIL, SIDE VIEW

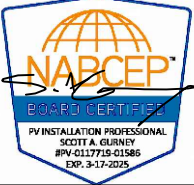
SCALE: 3/8" = 1'-0"



RACKING ATTACHMENTS TO BE STAGGERED BY SHIFTING EACH SUBSEQUENT ROW OF ATTACHMENTS ONE RAFTER OVER TO DISTRIBUTE LOAD ACROSS ALL FRAMING MEMBERS UNDER PV ARRAY.



A COMP SHINGLE - CLICKFIT LFOOT / FLASHING - STANDOFF DETAIL
SCALE: 3" = 1'-0"



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SITE ADDRESS
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EQUIP.
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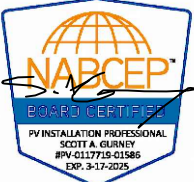
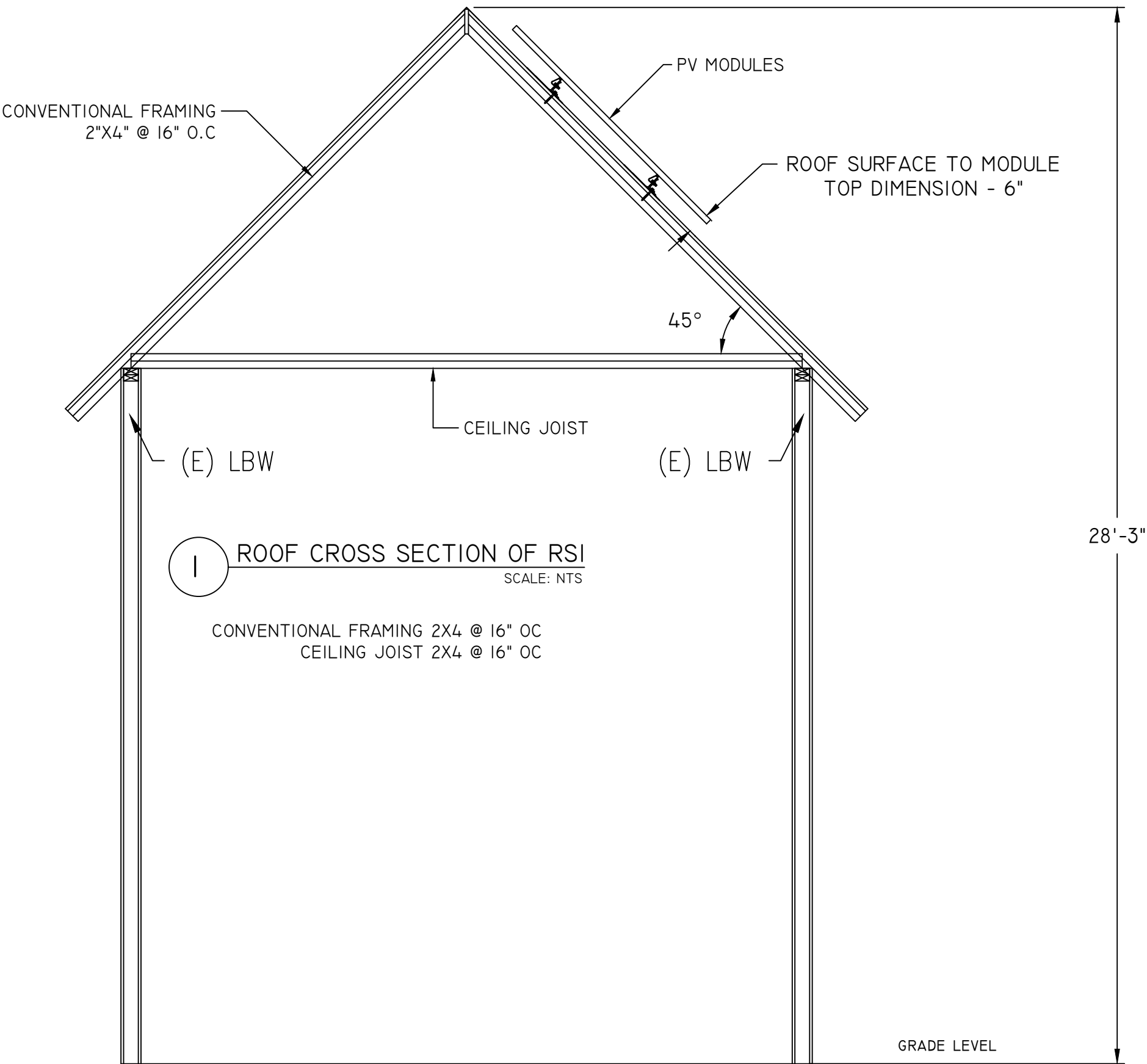
SYSTEM SIZE
3.78KW DC
2.61KW STC-AC, 3.373KW CEC-AC

PROJECT DESIGNER
NOAH MUNCK

DATE
22-FEB-2024

SHEET NAME
STRUCTURAL DETAILS

SHEET #	REV
S-4	0

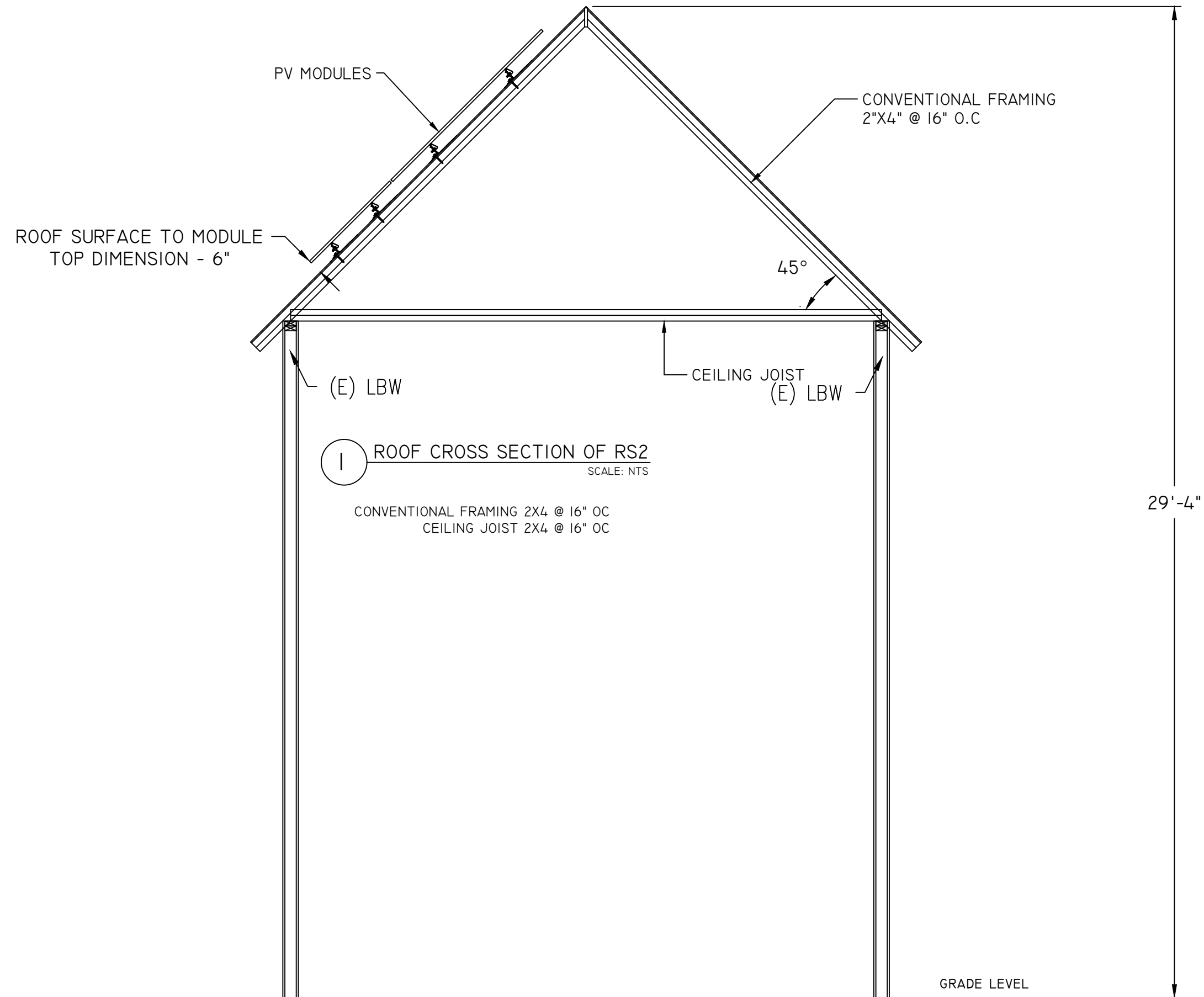


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PROJECT DESIGNER		NOAH MUNCK
DATE		22-FEB-2024
SHEET NAME		ROOF CROSS SECTION
SHEET #	REV	
S-4.1	0	



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PROJECT DESIGNER		NOAH MUNCK
DATE		22-FEB-2024
SHEET NAME		ROOF CROSS SECTION
SHEET #	REV	
S-4.2	0	

PV SYSTEM STRUCTURAL SPECIFICATIONS AND CALCULATIONS

DESIGN LOCATION AND SITE SPECIFICATIONS	
JURISDICTION	OREGON CITY
STATE	OREGON
ADOPTED LOAD STANDARD	ASCE 7-16
OCCUPANCY / RISK CATEGORY	II
BASIC WIND SPEED (MPH (3-SEC GUST))	97
WIND EXPOSURE CATEGORY	C
GROUND SNOW LOAD (PSF) (Pg)	36
BASE ELEVATION (FT)	448

PV SYSTEM STRUCTURAL SPECIFICATIONS	
STRUCTURE TYPE - ROOF SHAPE	INHABITED - GABLE / FLAT ROOF
MIN. ROOF SLOPE (DEG.)	45
MEAN ROOF HEIGHT (FT.)	23
PORTRAIT ATT. SPACING (IN. O.C.)	48
LANDSCAPE ATT. SPACING (IN. O.C.)	48
# OF ATTACHMENT POINTS	26
MAX. POINT LOAD (LBS / ATT.)	37.7
MAX. TOTAL PV DEAD LOAD TO RAFTER (LBS)	37.7

PV SYSTEM EQUIPMENT SPECIFICATIONS	
MODULE MANUFACTURER / TYPE	SILFAB SOLAR SIL-420 HC+
SOLAR MODULE WEIGHT (LBS)	47
SOLAR MODULE LENGTH (IN.)	75.3
SOLAR MODULE WIDTH (IN.)	40.8
SOLAR MODULE AREA (SQ. FT)	21.3
PV RACKING	ECOFASTEN CLICKFIT STANDARD
PV RACKING TYPE	RAIL
PV ROOF ATTACHMENT	CLICKFIT L-FOOT
PV ROOF ATTACHMENT FASTENER	5/16" X 3-1/2" ZINC PLATED STEEL LAG SCREW
RACKING DEAD LOAD (PSF)	0.8
SOLAR MODULE DEAD LOAD (PSF)	2.21
TOTAL PV ARRAY DEAD LOAD (PSF)	3.01

GRAVITY LOAD / FRAMING CALCULATIONS

DEAD LOAD (PSF)		RS1	RS2
ROOF MEMBRANE	COMPOSITION SHINGLE	4.0	COMPOSITION SHINGLE 4.0
SHEATHING	LUMBER AND PLYWOOD 45	4	LUMBER AND PLYWOOD 45
PITCH (DEG)	CONVENTIONAL FRAMING - NONE - SINGLE PLY (IX) - RAFTER 2X4 @ 16 IN. O.C. - DF #2 @ 8 FT. MAX SPAN	1.4	CONVENTIONAL FRAMING - NONE - SINGLE PLY (IX) - RAFTER 2X4 @ 16 IN. O.C. - DF #2 @ 8 FT. MAX SPAN 1.4
FRAMING			
TOTAL ROOF DEAD LOAD (PSF)		9.4	9.4
ADJUSTED TO SLOPED ROOF (PSF)		13.1	13.1
PV ARRAY ADJ. TO ROOF SLOPE (PSF)		4.2	4.2
ROOF LIVE LOAD < ROOF SNOW LOAD (PSF)		25.0	25.0
TOTAL LOAD (PSF)		42.4	42.4
RAFTER / TOP CHORD MEMBER PROPERITES	DF #2 - 2x4 - NONE - SINGLE PLY (IX)	DF #2 - 2x4 - NONE - SINGLE PLY (IX)	
SECTION MODULUS (S)(IN^3)	3.06	3.06	
MOMENT OF INERTIA (I)(IN^4)	5.36	5.36	
TOTAL LOAD ON MEMBER (W) (PLF)	56.5	56.5	
MAX. MEMBER SPAN (L) (FT)	8	8	
MODULUS OF ELASTICITY (E) (PSI)	1600000	1600000	
SHEAR (Fv) (PSI)	180	180	
AREA (A) (IN^2)	5.25	5.25	
MAX BENDING STRESS CHECK	(Fb)(Cd)(Cf)(Cr)	(Fb)(Cd)(Cf)(Cr)	
BENDING (Fb) (PSI)	900	900	
LOAD DURATION FACTOR (Cd)	1.15	1.15	
SIZE FACTOR (Cf)	1.50	1.50	
REPETITIVE MEMBER FACTOR (Cr)	1.15	1.15	
ALLOWABLE BENDING STRESS (PSI)	1785.4	1785.4	
ACTUAL BENDING STRESS (PSI) = (WL^2)/(8(S))	1770.1	1770.1	
	99% OK	99% OK	
MAX DEFLECTION CHECK - TOTAL LOAD	UNIFORM DISTRIBUTED	UNIFORM DISTRIBUTED	
ALLOWABLE DEFLECTION	L / 180	L / 180	
ACTUAL MAX DEFLECTION	0.533 IN.	0.533 IN.	
	(W)(L)^4 / 185(E)(I)	(W)(L)^4 / 185(E)(I)	
	0.252 IN.	0.252 IN.	
	47% OK	47% OK	
MAX DEFLECTION CHECK - LIVE LOAD	L / 240	L / 240	
ALLOWABLE DEFLECTION	0.4 IN.	0.4 IN.	
ACTUAL MAX DEFLECTION	0.222 IN.	0.222 IN.	
	56% OK	56% OK	
MAX SHEAR CHECK	Fv (A)	Fv (A)	
ALLOWABLE SHEAR	945 LBS.	945 LBS.	
	(W)(L)/2	(W)(L)/2	
ACTUAL MAX SHEAR	226 LBS.	226 LBS.	
	24% OK	24% OK	

DESIGNED ROOF SNOW LOAD CALCULATIONS		ASCE 7-16 (C&C)	
SLOPED ROOF SNOW LOAD (PSF)	= Ps = (Cs)(0.7)(Ce)(CT)(Is)(Pg)	EQN. 7.4-1	
EXPOSURE FACTOR (Ce)	= 1.0	TABLE 7.3-1	
THERMAL FACTOR (CT)	= 1.0	TABLE 7.3-2	
IMPORTANCE FACTOR (Is)	= 1.0	TABLE 1.5-2	
SLOPE FACTOR (Cs)	= 0.6	FIG. 7.4-1	
Ps (PSF)	= 25	OK	

DESIGN WIND PRESSURE CALCULATIONS		ASCE 7-16 (C&C)	
DESIGN WIND PRESSURE (PSF) = P = qh(GCP)(ye)(ya)		EQN. 26.10-1	
VELOCITY PRESSURE (PSF) = qh = 0.00256(Kh)(Kzt)(Kd)(Ke)(V^2)		TABLE 26.13-1	
TERRAIN EXPO. CONSTANT (A)	= 9.5	TABLE 26.11-1	
TERRAIN EXPO. CONSTANT (Zg)(FT)	= 900	TABLE 26.11-1	
VP EXPOSURE COEFF.(Kh)	= 0.93	EQN. C26.10-1	
TOPOGRAPHIC FACTOR (Kzt)	= 1.0	EQN. 26.8-1	
WIND DIRECTIONALITY FACTOR (Kd)	= 0.85	TABLE 26.6-1	
ARRAY EDGE FACTOR (ye)	= 1	EQN. 29.4-7	
qh (PSF)	= 19.02	FIG. 29.4-8	
		EQN. 26.10-1	

RAIL - COMPRESSION / UPLIFT		CONTINOUS SPAN BM = (WL^2)/(8(S))	
ECOFASTEN CLICKFIT STANDARD		4.0	
MAXIMUM HORIZONTAL RAIL SPAN (FT.) =		3.8	
MAXIMUM VERTICAL SPACING BETWEEN RAILS (FT.) =		COMPRESSION	UPLIFT
TOTAL LOAD (PSF) =		26.8	17.2
TOTAL LOAD (W)(LB. / FT.) =		101.2	65.0
ALLOWABLE MANU. BENDING MOMENT (LB. / FT.) =		422	517
ACTUAL MAX. BENDING STRESS (LB / FT.) =		202.4	130.0
		OK	OK

CONNECTIONS - UPLIFT / DOWNWARD		FIGURE 30.3-2D			
GABLE ROOF 27° < θ ≤ 45°		UPLIFT		DOWNWARD	
RAIL - PORTRAIT MODULE ORIENTATION		ZONE 1	ZONE 2R	ZONE 2E	ALL ZONES
		48 IN. O.C.	48 IN. O.C.	48 IN. O.C.	48 IN. O.C.
SOLAR PANEL PRESSURE EQ. FACTOR (ya)	= 0.80	0.80	0.80	0.80	0.80
EXTERNAL PRESSURE COEFF. (GCP)	= -1.8	-2.0	-3.2	0.9	
ASD PRESSURE (0.6P)(PSF)	= -16.43	-18.26	-29.21	22.82	
TRIBUTARY AREA (SQ. FT)	= 12.6	12.6	9.4		
MAX. UPLIFT (0.6D+0.6P) (LBS)	= -183.6	-206.5	-258.0		
RAIL - LANDSCAPE MODULE ORIENTATION		48 IN. O.C.	48 IN. O.C.	48 IN. O.C.	48 IN. O.C.
SOLAR PANEL PRESSURE EQ. FACTOR (ya)	= 0.80	0.80	0.80	0.80	
EXTERNAL PRESSURE COEFF. (GCP)	= -1.8	-2.0	-3.2	0.9	
ASD PRESSURE (0.6P)(PSF)	= -16.43	-18.26	-29.21	22.82	
TRIBUTARY AREA (SQ. FT)	= 6.80	6.80	5.10		
MAX. UPLIFT (0.6D+0.6P) (LBS)	= -99.5	-111.9	-139.8		

ROOF ATTACHMENT / FASTENER CHECK NDS 12.2

CLICKFIT L-FOOT - 5/16" X 3-1/2" ZINC PLATED STEEL LAG SCREW			
LAG SCREW WITHDRAWAL DESIGN VALUE (LBS) = W = 1800(G^3/2)(D^3/4)		12.2.1	
ROOF ATTACHMENT FASTENER (D) (IN.) =	5/16	TABLE 2.3.2	
FASTENER QTY PER ATTACHMENT =	1	TABLE 12.3.3A	
FASTENER EMBEDMENT DEPTH (IN.) =	2.5		
LUMBER SPECIFIC GRAVITY (G) =	0.5		
LOAD DURATION FACTOR (Cd) =	1.6		
PRYING COEFFICIENT =	1.5		
WITHDRAWAL DESIGN VALUE(W)(LBS / IN.) =	266.0		
LAG SCREW WITHDRAWL CAPACITY (LBS) =	709.3		
MANUFACTURER MAX. UPLIFT CAPACITY (LBS) =	895.0		
MAX. ATT. WITHDRAWAL CAPACITY (LBS) =	709.3		
MAX. ATT. WITHDRAWL STRESS (LBS) =	258.0	OK	



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CI524



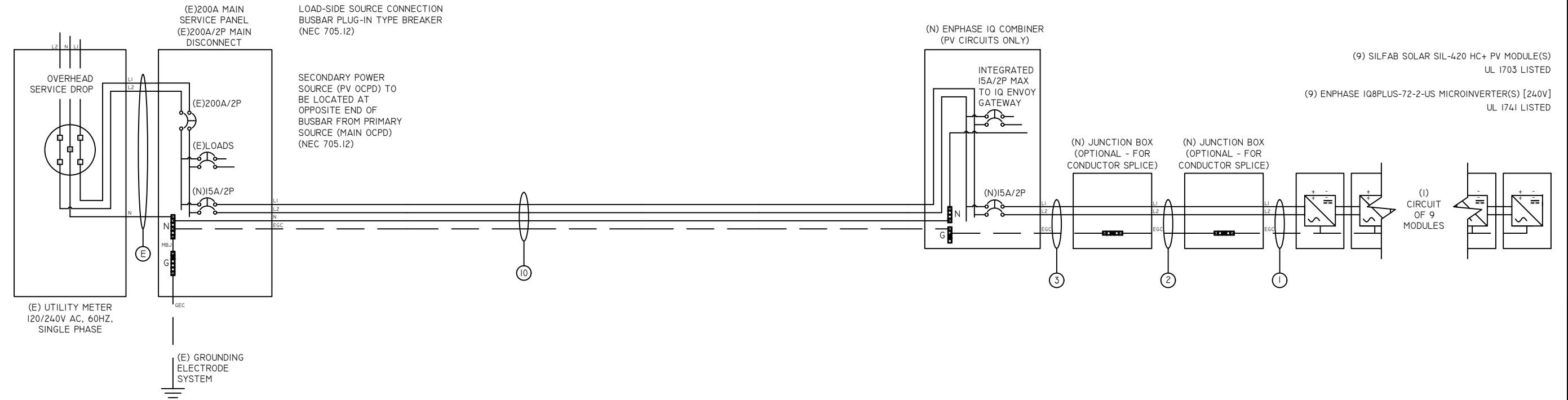
ION SOLAR
44 E 800 N
OREM, UTAH 84057
888.781.7074

PROJECT ID		00CIDL
SITE OWNER		T G POPPINO
SITE ADDRESS		720 IITH STREET OREGON CITY, OREGON 97045
EQUIP.		(9) SILFAB SOLAR SIL-420 HC+ (9) ENPHASE IQ8PLUS-72-2-US
SYSTEM SIZE		3.78KW DC 2.61KW STC-AC, 3.373KW CEC-AC
PROJECT DESIGNER		NOAH MUNCK
DATE		22-FEB-2024
SHEET NAME		STRUCTURAL CALCULATIONS
SHEET #	REV	
S-5		0

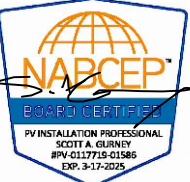
CONDUCTOR AND RACEWAY SCHEDULE

TAG	QTY	SIZE - #	TYPE	DESIGNATOR	I / V	TAG	QTY	SIZE - #	TYPE	DESIGNATOR	I / V	TAG	QTY	SIZE - #	TYPE	DESIGNATOR	I / V	TAG	QTY	SIZE - #	TYPE	DESIGNATOR	I / V
10	(1)	10 AWG	THHN / THWN-2, CU.	BLACK (L1)	10.89 A AC (MAX)	3	(1)	10 AWG	THHN / THWN-2, CU.	BLACK (L1)	10.89 A AC (MAX)	2	(1)	10 AWG	2C, NM-B W/G, CU.	(L1, L2, EGC)	10.89 A AC (MAX)	1	(1)	12 AWG	2C, TC-ER, CU.	(L1, L2)	10.89 A AC (MAX)
	(1)	10 AWG	THHN / THWN-2, CU.	RED (L2)	240 V AC		(1)	10 AWG	THHN / THWN-2, CU.	RED (L2)	240 V AC				(CABLE)		240 V AC		(1)	6 AWG	SOLID BARE CU.	(EGC)	240 V AC
	(1)	10 AWG	THHN / THWN-2, CU.	WHITE (N)			(1)	10 AWG	THHN / THWN-2, CU.	GREEN (EGC)													
	(1)	10 AWG	THHN / THWN-2, CU.	GREEN (EGC)			(1)	3/4 IN.	EMT	(RACEWAY)													
	(1)	3/4 IN.	EMT	(RACEWAY)																			
					EXTERIOR						EXTERIOR						INTERIOR						EXTERIOR

ELECTRICAL LINE DIAGRAM



ELECTRICAL LINE DIAGRAM NOTES



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CI524



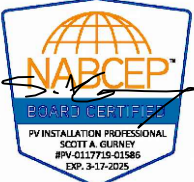
ION SOLAR
44 E 800 N
OREM, UTAH 84057
888.781.7074

PROJECT ID	00CIDL
SITE OWNER	T G POPPINO
SITE ADDRESS	720 IITH STREET OREGON CITY, OREGON 97045
EQUIP.	(9) SILFAB SOLAR SIL-420 HC+ (9) ENPHASE IQ8PLUS-72-2-US
SYSTEM SIZE	3.78KW DC 2.61KW STC-AC, 3.373KW CEC-AC
PROJECT DESIGNER	NOAH MUNCK
DATE	22-FEB-2024
SHEET NAME	ELECTRICAL LINE DIAGRAM
SHEET #	REV E-6 0

PV SYSTEM ELECTRICAL SPECIFCATIONS AND CALCULATIONS

DESIGN LOCATION AND TEMPERATURES						
TEMPERATURE DATA SOURCE		ASHRAE				
STATE		OREGON				
JURISDICTION		OREGON CITY				
WEATHER STATION		AURORA STATE AP				
ASHRAE EXTREME LOW TEMP (°C)		-5				
ASHRAE 0.4% HIGH TEMP (°C)		37				
DESIGNED MAX. SYSTEM VDROP / VRISE		4.00%				
PV MODULE SPECIFICATIONS		SILFAB SOLAR SIL-420 HC+				
RATED POWER (PMAX) (W)		420				
MAXIMUM POWER VOLTAGE (VMP)		39.19				
MAXIMUM POWER CURRENT (IMP)		10.72				
OPEN CIRCUIT VOLTAGE (VOC)		45.67				
SHORT CIRCUIT CURRENT (ISC)		11.46				
PMP/VMP TEMP. COEFFICIENT		-0.36				
VOC TEMP. COEFFICIENT		-0.28				
SERIES FUSE RATING		20				
ADJ. MODULE VOC @ ASHRAE LOW TEMP		49.5				
ADJ. MODULE VMP @ ASHRAE 2% AVG. HIGH TEMP		33.0				
INVERTER SPECIFICATIONS		ENPHASE IQ8PLUS-72-2-US				
TYPE		MICROINVERTER				
MAX. OR RECOMMENDED MODULE POWER (W)		440				
MAXIMUM INPUT DC OPEN-CIRCUIT VOLTAGE (VOC)		60				
MINIMUM START VOLTAGE (V)		30				
MAXIMUM START VOLTAGE(V)		58				
MAXIMUM INPUT CURRENT (ISC) (A)		15				
MAX CONTINUOUS OUTPUT POWER (VA)		290				
MAX. CONTINUOUS OUTPUT CURRENT (A)		1.21				
NOMINAL (L-L) OUTPUT VOLTAGE		240				
CEC WEIGHTED EFFICIENCY (%)		97.0%				
SYSTEM ELECTRICAL SPECIFICATIONS		CIR 1				
NUMBER OF MODULES PER CIRCUIT		9				
DC POWER RATING PER CIRCUIT (STC)(W DC)		3780				
TOTAL MODULE QUANTITY		9 PV MODULES				
STC DC POWER RATING OF ARRAY		3780W DC				
INVERTER OUTPUT CIRCUIT CURRENT(A AC)		10.89				
I25% INVERTER OUTPUT CIRCUIT CURRENT(A AC)		13.61				
CIRCUIT OCPD RATING (A)		15				
COMBINED INVERTER CONTINUOUS OUTPUT CURRENT		10.89A				
PV POWER PRODUCTION SYSTEM OCPD RATING (X125%)		AC				
MAX. ARRAY STC-AC POWER (W)		15A				
MAX. ARRAY CEC-AC POWER (W)		2610W AC (STC)				
		3373W AC (CEC)				
AC VOLTAGE RISE CALCULATIONS		DIST (FT)	COND.	VRISE(V)	VEND(V)	%VRISE
VRISE SEC. 1 (MICRO TO JBOX) *		28.8	12 Cu.	1.3	241.3	0.52%
VRISE SEC. 2 (JBOX TO COMBINER BOX)		50	10 Cu.	1.3	241.3	0.54%
VRISE SEC. 3 (COMBINER BOX TO POI)		10	10 Cu.	0.3	240.3	0.11%
TOTAL VRISE				2.8	242.8	1.18% OK
* 8 MICROINVERTER MAX SUB-BRANCH CIRCUIT SIZE TO COMPLY WITH VRISE CALCULATIONS.						

RACEWAY / CONDUCTOR CALCULATIONS				
MICROINV. TO JUNCTION BOX (1)				
MAX INVERTER OUTPUT CIRCUIT CURRENT =		10.9 A AC		
CONDUCTOR SIZE / INSULATION / TYPE =		12 AWG	2C, TC-ER, CU.	
CONDUCTOR AMP. RATING @ 90°C =		30 A		
PER NEC 690.8(B)(1)(W/OUT CORRECTION FACTORS)				
MAX INVERTER OUTPUT CURRENT X125%=		14.0 A AC		
PER NEC 690.8(B)(2)(WITH CORRECTION FACTORS)				
AMB. TEMP. AMP. CORRECTION =		0.91		
# OF CONDUCTORS IN RACEWAY CORRECTION =		1.0		
ADJUSTED CONDUCTOR AMPACITY (A) =		27.3 A AC		
LARGER AMPACITY OF 690.8(B)(1) OR (B)(2) =		14.0 < 27.3		
LARGER AMPACITY COMPLIANCE =		(B)(1) - W/OUT CORRECTION FACTORS		
		30.0 > 14.0	OK	
RACEWAY SIZE / TYPE =		3/4 IN.	EMT OR NO RACEWAY	
CONDUCTOR(S) / CABLE(S) CROSS-SECTION AREA (IN.^2) =		0.142 IN.2		
CROSS-SECTIONAL AREA OF RACEWAY(IN.^2) =		0.533 IN.2		
% ALLOWABLE RACEWAY FILL (NEC CH. 9, TBL 1) =		53% > 27%	OK	
JUNCTION BOX TO JUNCTION BOX (2)				
MAX INVERTER OUTPUT CIRCUIT CURRENT =		10.9 A AC		
CONDUCTOR SIZE / INSULATION / TYPE =		10 AWG	2C, NM-B W/G, CU.	
CONDUCTOR AMP. RATING @60°C =		30 A		
PER NEC 690.8(B)(1)(W/OUT CORRECTION FACTORS)				
MAX INVERTER OUTPUT CURRENT X125%=		14.0 A AC		
PER NEC 690.8(B)(2)(WITH CORRECTION FACTORS)				
AMB. TEMP. AMP. CORRECTION =		0.82		
# OF CONDUCTORS IN RACEWAY CORRECTION =		1.0		
ADJUSTED CONDUCTOR AMPACITY (A) =		24.6 A AC		
LARGER AMPACITY OF 690.8(B)(1) OR (B)(2) =		14.0 < 24.6		
LARGER AMPACITY COMPLIANCE =		(B)(1) - W/OUT CORRECTION FACTORS		
		30.0 > 14.0	OK	
RACEWAY SIZE / TYPE =		NO RACEWAY		
JUNCTION BOX TO COMBINER BOX (3)				
MAX INVERTER OUTPUT CIRCUIT CURRENT =		10.9 A AC		
CONDUCTOR SIZE / INSULATION / TYPE =		10 AWG	THHN / THWN-2, CU.	
CONDUCTOR AMP. RATING @75°C =		30 A		
PER NEC 690.8(B)(1)(W/OUT CORRECTION FACTORS)				
MAX INVERTER OUTPUT CURRENT X125%=		14.0 A AC		
PER NEC 690.8(B)(2)(WITH CORRECTION FACTORS)				
AMB. TEMP. AMP. CORRECTION =		0.88		
# OF CONDUCTORS IN RACEWAY CORRECTION =		1.0		
ADJUSTED CONDUCTOR AMPACITY (A) =		26.4 A AC		
LARGER AMPACITY OF 690.8(B)(1) OR (B)(2) =		14.0 < 26.4		
LARGER AMPACITY COMPLIANCE =		(B)(1) - W/OUT CORRECTION FACTORS		
		30.0 > 14.0	OK	
RACEWAY SIZE / TYPE =		3/4 IN.	EMT	
CONDUCTOR(S) / CABLE(S) CROSS-SECTION AREA (IN.^2) =		0.063 IN.^2		
CROSS-SECTIONAL AREA OF RACEWAY(IN.^2) =		0.533 IN.^2		
% ALLOWABLE RACEWAY FILL (NEC CH. 9, TBL 1) =		40% > 12%	OK	
COMBINER BOX TO MAIN PV OCPD (10)				
COMBINED INVERTER CONTINUOUS OUTPUT CURRENT =		10.9 A AC		
CONDUCTOR SIZE / INSULATION / TYPE =		10 AWG	THHN / THWN-2, CU.	
CONDUCTOR AMP. RATING @75°C =		35 A		
PER NEC 690.8(B)(1)(W/OUT CORRECTION FACTORS)				
MAX COMBINED INVERTER CONTINUOUS OUTPUT CURRENT X125% =		14.0 A AC		
PER NEC 690.8(B)(2)(WITH CORRECTION FACTORS)				
AMB. TEMP. AMP. CORRECTION =		0.88		
# OF CONDUCTORS IN RACEWAY CORRECTION =		1.0		
ADJUSTED CONDUCTOR AMPACITY (A) =		30.8 A AC		
LARGER AMPACITY OF 690.8(B)(1) OR (B)(2) =		14.0 < 30.8		
LARGER AMPACITY COMPLIANCE =		(B)(1) - W/OUT CORRECTION FACTORS		
		35.0 > 14.0	OK	
RACEWAY SIZE / TYPE =		3/4 IN.	EMT	
CONDUCTOR(S) / CABLE(S) CROSS-SECTION AREA (IN.^2) =		0.084 IN.^2		
CROSS-SECTIONAL AREA OF RACEWAY(IN.^2) =		0.533 IN.^2		
% ALLOWABLE RACEWAY FILL (NEC CH. 9, TBL 1) =		40% > 16%	OK	



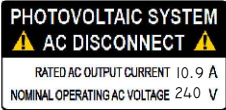
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CI524



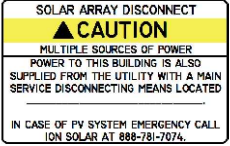
ION SOLAR
44 E 800 N
OREM, UTAH 84057
888.781.7074

PROJECT ID		00CIDL
SITE OWNER		T G POPPINO
SITE ADDRESS		720 IITH STREET OREGON CITY, OREGON 97045
EQUIP.		(9) SILFAB SOLAR SIL-420 HC+ (9) ENPHASE IQ8PLUS-72-2-US
SYSTEM SIZE		3.78KW DC 2.61KW STC-AC, 3.373KW CEC-AC
PROJECT DESIGNER		NOAH MUNCK
DATE		22-FEB-2024
SHEET NAME		ELECTRICAL CALCULATIONS
SHEET #	REV	
E-7		0

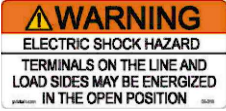
ELECTRICAL FIELD-APPLIED HAZARD MARKINGS



E AT EACH PV SYSTEM DISCONNECTING MEANS. [OESC 690.54, OESC 690.13(B)]



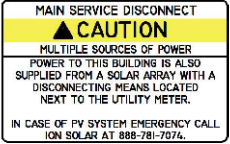
N PERMANENT DIRECTORY TO BE LOCATED AT MAIN SERVICE EQUIPMENT LOCATION IF ALL ELECTRICAL POWER SOURCE DISCONNECTING MEANS (SOLAR ARRAY RAPID SHUTDOWN SWITCH) ARE GROUPED AND IN LINE OF SITE OF MAIN SERVICE DISCONNECTING MEANS. [OESC 690.56(C) & OESC 705.10].



F FOR PV DISCONNECTING MEANS WHERE ALL TERMINALS OF THE DISCONNECTING MEANS MAY BE ENERGIZED IN THE OPEN POSITION. [OESC 690.13(B), OESC 705.22]



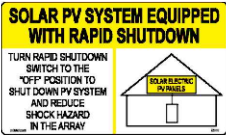
G AT EQUIPMENT CONTAINING OVERCURRENT DEVICES IN CIRCUITS SUPPLYING POWER TO A BUSBAR OR CONDUCTOR SUPPLIED FROM MULTIPLE SOURCES. [OESC 705.12(C)]



P PERMANENT DIRECTORY TO BE LOCATED AT SOLAR ARRAY RAPID SHUTDOWN SWITCH DENOTING THE LOCATION OF THE SERVICE EQUIPMENT LOCATION IF SOLAR ARRAY RAPID SHUT DOWN DISCONNECT SWITCH IS NOT GROUPED AND WITHIN LINE OF SITE OF MAIN SERVICE DISCONNECTING MEANS. [OESC 705.10]



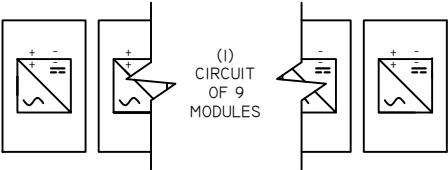
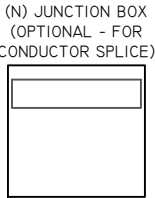
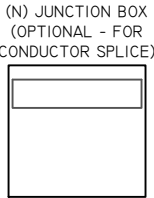
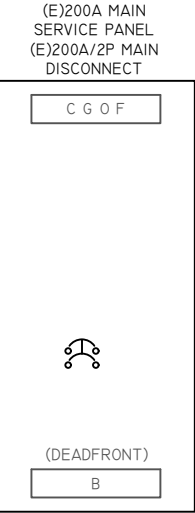
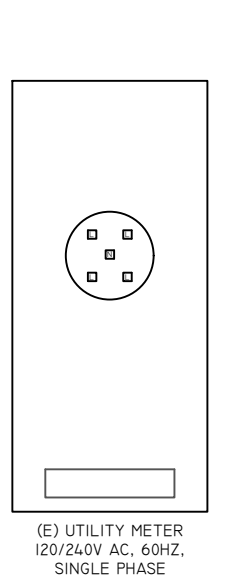
B PLACED ADJACENT TO PV SYSTEM PLUG-IN TYPE BREAKER TO A BUSBAR FOR A LOAD SIDE CONNECTION. [OESC 705.12(B)(3)(2)]



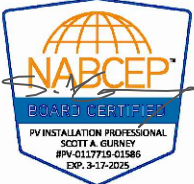
C SIGN LOCATED ON OR NO MORE THAN 3 FT FROM THE RAPID SHUT DOWN DISCONNECT SWITCH(S). IF MORE THAN ONE PV RSD IS IN AN ENCLOSURE, EACH SHALL BE LABELED. [OESC 690.56(C), OESC 690.12(C)]



D FOR RAPID SHUTDOWN SWITCH INITIATION DEVICE LOCATED AT A READILY ACCESSIBLE OUTDOOR LOCATION. [OESC 690.12]



- ALL CAUTION, WARNING, OR DANGER SIGNS OR LABELS SHALL:
- 1, COMPLY WITH ANSI Z535.4-2011 STANDARDS.
 2. BE PERMANENTLY AFFIXED TO THE EQUIPMENT OR WIRING METHOD AND SHALL NOT BE HANDWRITTEN.
 3. SHALL BE OF SUFFICEINT DURABILITY TO WITHSTAND THE ENVIRONMENT INVOLVED.
 4. UNLESS OTHERS SPECIFIED MINIMUM TEXT HEIGHT TO BE 1/8" (3MM).



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PROJECT ID	00CIDL
SITE OWNER	T G POPPINO
SITE ADDRESS	720 IITH STREET OREGON CITY, OREGON 97045
EQUIP.	(9) SILFAB SOLAR SIL-420 HC+ (9) ENPHASE IQ8PLUS-72-2-US
SYSTEM SIZE	3.78KW DC 2.6IKW STC-AC, 3.373KW CEC-AC
PROJECT DESIGNER	NOAH MUNCK
DATE	22-FEB-2024
SHEET NAME	ELECTRICAL LABELS
SHEET #	REV
E-9	0



Installation Summary

Homeowner Obligations Before Install:

None

Aurora Shade Report

Customer
Teri Grace Poppino

Designer
Surendra ESR

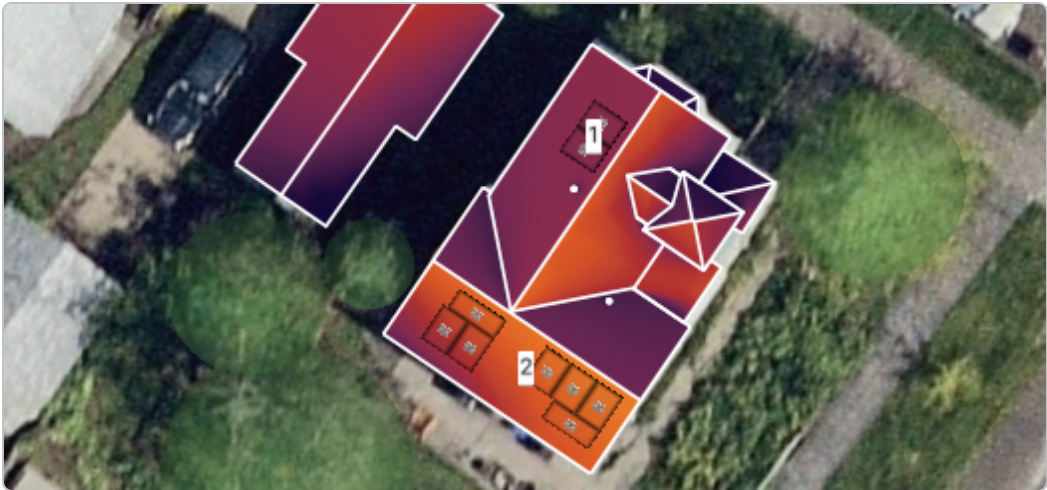
Organization
Ion Solar

Address
720 11th St
Oregon City, OR 97045,
USA

Coordinates
(45.358307, -122.600801)

Date
22 February 2024

Annual irradiance



 Summary

Array	Panel Count	Azimuth (deg.)	Pitch (deg.)	Annual TOF (%)	Annual Solar Access (%)	Annual TSRF (%)
1	2	304	45	62	92	57
2	7	214	45	96	84	81
Weighted average by panel count	-	-	-	-	85.8	75.4

Monthly solar access (%) across arrays

Array	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	79	84	82	91	96	97	98	96	80	82	81	81
2	71	78	81	84	88	90	89	87	83	81	77	73

Customer

Teri Grace Poppino

Designer

Surendra ESR

Organization

Ion Solar

Address

720 11th St
Oregon City, OR 97045,
USA

Coordinates

(45.358307, -122.600801)

Date

22 February 2024

Zoomed out satellite view

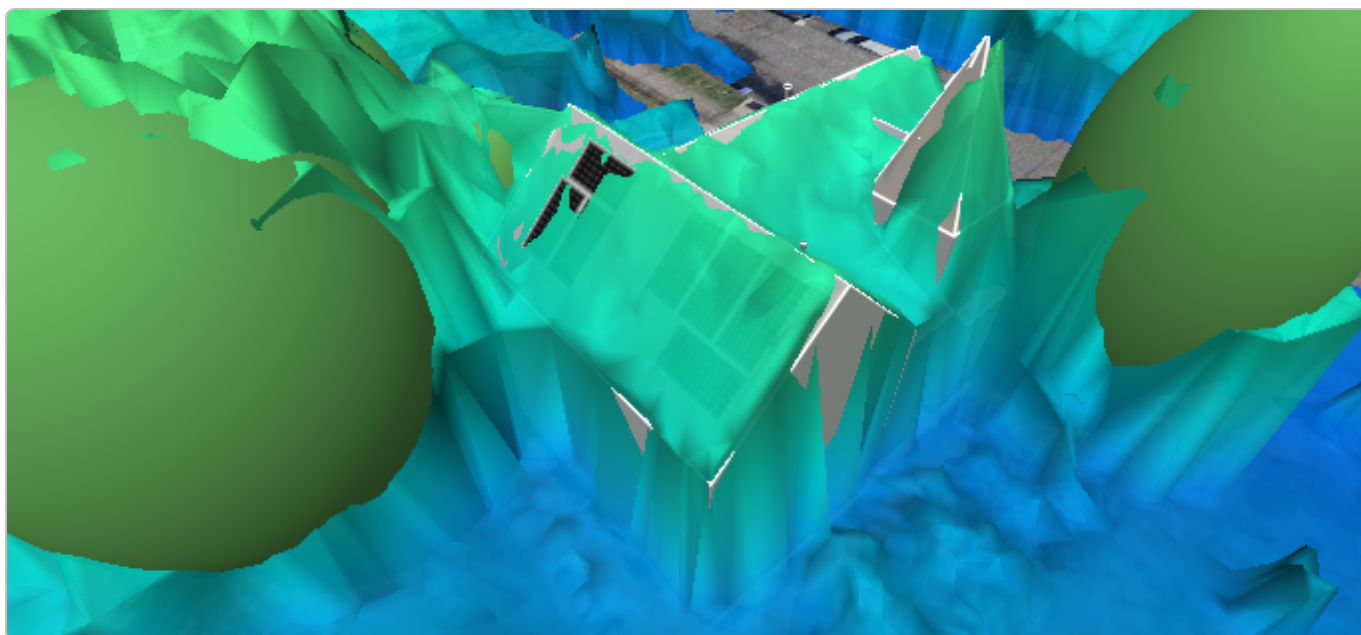


3D model



3D model with LIDAR overlay

15 ft



Customer

Teri Grace Poppino

Designer

Surendra ESR

Organization

Ion Solar

Address

720 11th St
Oregon City, OR 97045,
USA

Coordinates

(45.358307, -122.600801)

Date

22 February 2024

Street view and corresponding 3D model

I, **Surendra ESR**, certify that I have generated this shading report to the best of my abilities, and I believe its contents to be accurate.

Estimated Production					
January Est. Production	106			February Est. Production	151
March Est. Production	272			April Est. Production	337
May Est. Production	460			June Est. Production	489
July Est. Production	522			August Est. Production	462
September Est. Production	326			October Est. Production	204
November Est. Production	113			December Est. Production	93

Usage					
January Usage	405			February Usage	360
March Usage	300			April Usage	275
May Usage	275			June Usage	300
July Usage	20			August Usage	410
September Usage	310			October Usage	250
November Usage	315			December Usage	450

Signature Certificate

Reference number: EY8T8-IZ8PQ-8X7KR-QGT8Y

Signer

Timestamp

Signature

Dustin Davidson

Email: dustin.davidson@ionsolar.com

Sent:

25 Mar 2024 16:20:05 UTC

Signed:

25 Mar 2024 16:20:05 UTC



IP address: 8.33.47.146

Location: Orem, United States

Teri Poppino

Email: turreymoon@gmail.com

Sent:

25 Mar 2024 16:20:05 UTC

Viewed:

25 Mar 2024 16:32:20 UTC

Signed:

25 Mar 2024 16:33:16 UTC



Recipient Verification:

✓ Email verified

25 Mar 2024 16:32:20 UTC

IP address: 67.161.104.48

Location: Portland, United States

Document completed by all parties on:

25 Mar 2024 16:33:16 UTC

Page 1 of 1



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Material Descriptions and Photos

Silfab SIL-420 HC+ Solar Panels

The solar panels are 6.275' x 3.4' x 1.37" and are solid black.



Panels installed on Beverly Dr.



Panels installed on Charman St.

Enphase IQ8Plus-72-2-US Microinverters

The microinverters are black and are mounted under the solar panels.



EcoFasten ClickFit Rail Mounting Hardware

The mounting hardware is silver and black. The components visible after installation are black.



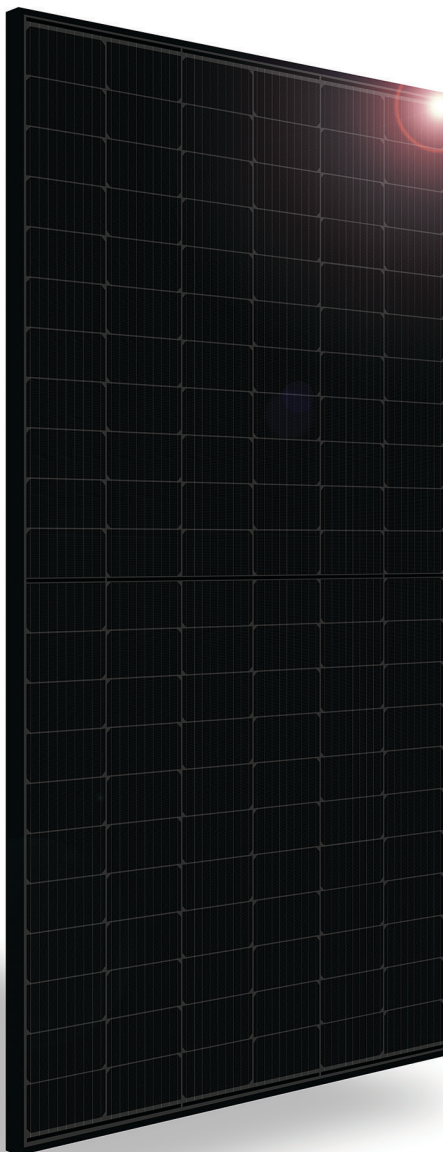
Enphase IQ Combiner Box

The combiner box is silver/grey and will be mounted to the left of the utility meter.



SILFAB PRIME

SIL-420 HC+



RELIABLE ENERGY.
DIRECT FROM THE SOURCE.

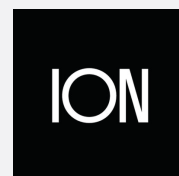
Designed to outperform.

Dependable, durable, high-performance
solar panels engineered for North
American homeowners.

[SILFABSOLAR.COM](https://silfabsolar.com)



PROUD
PARTNER OF



CHUBB®

* Chubb provides error and omission insurance to Silfab Solar Inc.

ELECTRICAL SPECIFICATIONS		420	
Test Conditions		STC	NOCT
Module Power (Pmax)	Wp	420	313
Maximum power voltage (Vpmax)	V	39.19	36.42
Maximum power current (Ipmax)	A	10.72	8.59
Open circuit voltage (Voc)	V	45.67	42.84
Short circuit current (Isc)	A	11.46	9.24
Module efficiency	%	21.2%	19.7%
Maximum system voltage (VDC)	V	1000	
Series fuse rating	A	20	
Power Tolerance	Wp	±3%	

Measurement conditions: STC 1000 W/m² • AM 1.5 • Temperature 25 °C • NOCT 800 W/m² • AM 1.5 • Measurement uncertainty ≤ 3%
Sun simulator calibration reference modules from Fraunhofer Institute. Electrical characteristics may vary by ±5% and power by ±3%.

MECHANICAL PROPERTIES / COMPONENTS	METRIC	IMPERIAL
Module weight	21.3kg ±0.2kg	47lbs ±0.4lbs
Dimensions (H x L x D)	1914 mm x 1036 mm x 35 mm	75.3 in x 40.8 in x 1.37 in
Maximum surface load (wind/snow)*	5400 Pa rear load / 5400 Pa front load	112.8 lb/ft ² rear load / 112.8 lb/ft ² front load
Hail impact resistance	ø 25 mm at 83 km/h	ø 1 in at 51.6 mph
Cells	132 Half cells - Si mono PERC 9 busbar - 83 x 166 mm	132 Half cells - Si mono PERC 9 busbar - 3.26 x 6.53 in
Glass	3.2 mm high transmittance, tempered, anti-reflective coating	0.126 in high transmittance, tempered, anti-reflective coating
Cables and connectors (refer to installation manual)	1350 mm, ø 5.7 mm, MC4 from Staubli	53 in, ø 0.22 in (12AWG), MC4 from Staubli
Backsheet	High durability, superior hydrolysis and UV resistance, multi-layer dielectric film, fluorine-free PV backsheet	
Frame	Anodized Aluminum (Black)	
Bypass diodes	3 diodes-30SQ045T (45V max DC blocking voltage, 30A max forward rectified current)	
Junction Box	UL 3730 Certified, IEC 62790 Certified, IP68 rated	

TEMPERATURE RATINGS		WARRANTIES	
Temperature Coefficient Isc	+0.064 %/°C	Module product workmanship warranty	25 years**
Temperature Coefficient Voc	-0.28 %/°C	Linear power performance guarantee	30 years
Temperature Coefficient Pmax	-0.36 %/°C	≥ 97.1% end 1st yr ≥ 91.6% end 12th yr ≥ 85.1% end 25th yr ≥ 82.6% end 30th yr	
NOCT (± 2°C)	45 °C		
Operating temperature	-40/+85 °C		

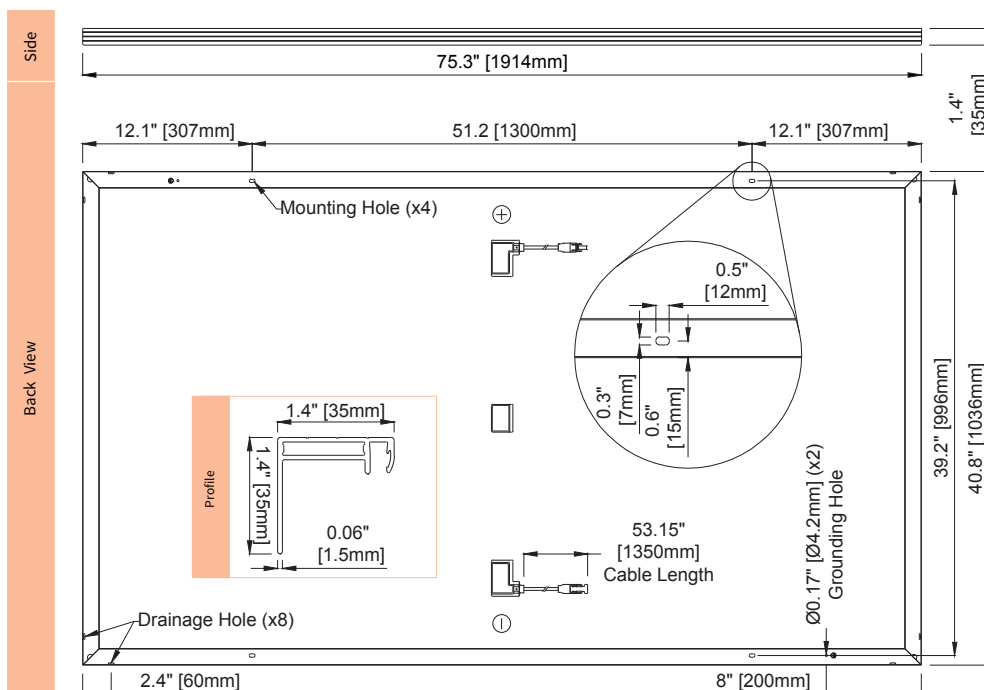
CERTIFICATIONS		SHIPPING SPECS	
Product	UL 61215-1:2017 Ed.1***, UL 61215-2:2017 Ed.1***, UL 61730-1:2017 Ed.1, UL 61730-2:2017 Ed.1, CSA C22.2#61730-1:2019 Ed.2, CSA C22.2#61730-2:2019 Ed.2, IEC 61215-1:2016 Ed.1***, IEC 61215-2:2016 Ed.1***, IEC 61730-1:2016 Ed.2, IEC 61730-2:2016 Ed.2, IEC 61701:2020 (Salt Mist Corrosion), IEC 62716:2013 (Ammonia Corrosion), CEC Listing, UL Fire Rating: Type 2	Modules Per Pallet:	26 or 26 (California)
Factory	ISO9001:2015	Pallets Per Truck	32 or 30 (California)
		Modules Per Truck	832 or 780 (California)

* ⚠ Warning. Read the Safety and Installation Manual for mounting specifications and before handling, installing and operating modules.

** 12 year extendable to 25 years subject to registration and conditions outlined under "Warranty" at silfabsolar.com.

PAN files generated from 3rd party performance data are available for download at: silfabsolar.com/downloads.

*** Certification in progress.



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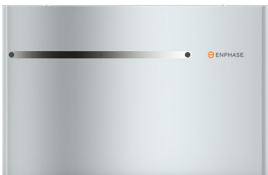
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IQ8 and IQ8+ Microinverters

Our newest IQ8 Microinverters are the industry's first microgrid-forming, software-defined microinverters with split-phase power conversion capability to convert DC power to AC power efficiently. The brain of the semiconductor-based microinverter is our proprietary application-specific integrated circuit (ASIC) which enables the microinverter to operate in grid-tied or off-grid modes. This chip is built in advanced 55nm technology with high speed digital logic and has super-fast response times to changing loads and grid events, alleviating constraints on battery sizing for home energy systems.



Part of the Enphase Energy System, IQ8 Series Microinverters integrate with the Enphase IQ Battery, Enphase IQ Gateway, and the Enphase App monitoring and analysis software.



IQ8 Series Microinverters redefine reliability standards with more than one million cumulative hours of power-on testing, enabling an industry-leading limited warranty of up to 25 years.



Connect PV modules quickly and easily to IQ8 Series Microinverters using the included Q-DCC-2 adapter cable with plug-n-play MC4 connectors.



IQ8 Series Microinverters are UL Listed as PV Rapid Shut Down Equipment and conform with various regulations, when installed according to manufacturer's instructions.

Easy to install

- Lightweight and compact with plug-n-play connectors
- Power Line Communication (PLC) between components
- Faster installation with simple two-wire cabling

High productivity and reliability

- Produce power even when the grid is down*
- More than one million cumulative hours of testing
- Class II double-insulated enclosure
- Optimized for the latest high-powered PV modules

Microgrid-forming

- Complies with the latest advanced grid support**
- Remote automatic updates for the latest grid requirements
- Configurable to support a wide range of grid profiles
- Meets CA Rule 21 (UL 1741-SA) requirements

IQ8 and IQ8+ Microinverters

INPUT DATA (DC)		IQ8-60-2-US	IQ8PLUS-72-2-US
Commonly used module pairings ¹	W	235 – 350	235 – 440
Module compatibility		60-cell/120 half-cell	60-cell/120 half-cell, 66-cell/132 half-cell and 72-cell/144 half-cell
MPPT voltage range	V	27 – 37	29 – 45
Operating range	V	25 – 48	25 – 58
Min/max start voltage	V	30 / 48	30 / 58
Max input DC voltage	V	50	60
Max DC current ² [module Isc]	A	15	
Overvoltage class DC port		II	
DC port backfeed current	mA	0	
PV array configuration		1x1 Ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit	
OUTPUT DATA (AC)		IQ8-60-2-US	IQ8PLUS-72-2-US
Peak output power	VA	245	300
Max continuous output power	VA	240	290
Nominal (L-L) voltage/range ³	V	240 / 211 – 264	
Max continuous output current	A	1.0	1.21
Nominal frequency	Hz	60	
Extended frequency range	Hz	50 – 68	
AC short circuit fault current over 3 cycles	Arms	2	
Max units per 20 A (L-L) branch circuit ⁴		16	13
Total harmonic distortion		<5%	
Overvoltage class AC port		III	
AC port backfeed current	mA	30	
Power factor setting		1.0	
Grid-tied power factor (adjustable)		0.85 leading – 0.85 lagging	
Peak efficiency	%	97.5	97.6
CEC weighted efficiency	%	97	97
Night-time power consumption	mW	60	
MECHANICAL DATA			
Ambient temperature range		-40°C to +60°C (-40°F to +140°F)	
Relative humidity range		4% to 100% (condensing)	
DC Connector type		MC4	
Dimensions (HxWxD)		212 mm (8.3”) x 175 mm (6.9”) x 30.2 mm (1.2”)	
Weight		1.08 kg (2.38 lbs)	
Cooling		Natural convection – no fans	
Approved for wet locations		Yes	
Pollution degree		PD3	
Enclosure		Class II double-insulated, corrosion resistant polymeric enclosure	
Environ. category / UV exposure rating		NEMA Type 6 / outdoor	
COMPLIANCE			
		CA Rule 21 (UL 1741-SA), UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01	
Certifications		This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC 2014, NEC 2017, and NEC 2020 section 690.12 and C22.1-2018 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according to manufacturer’s instructions.	

(1) No enforced DC/AC ratio. See the compatibility calculator at <https://link.enphase.com/module-compatibility>

(2) Maximum continuous input DC current is 10.6A (3) Nominal voltage range can be extended beyond nominal if required by the utility. (4) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

IQ8SP-DS-0002-01-EN-US-2022-03-17

Enphase IQ Combiner 4/4C

X-IQ-AM1-240-4
X-IQ-AM1-240-4C

The **Enphase IQ Combiner 4/4C** with IQ Gateway and integrated LTE-M1 cell modem (included only with IQ Combiner 4C) consolidates interconnection equipment into a single enclosure and streamlines IQ microinverters and storage installations by providing a consistent, pre-wired solution for residential applications. It offers up to four 2-pole input circuits and Eaton BR series busbar assembly.

Smart

- Includes IQ Gateway for communication and control
- Includes Enphase Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), included only with IQ Combiner 4C
- Includes solar shield to match Enphase IQ Battery aesthetics and deflect heat
- Flexible networking supports Wi-Fi, Ethernet, or cellular
- Optional AC receptacle available for PLC bridge
- Provides production metering and consumption monitoring

Simple

- Centered mounting brackets support single stud mounting
- Supports bottom, back and side conduit entry
- Up to four 2-pole branch circuits for 240 VAC plug-in breakers (not included)
- 80A total PV or storage branch circuits

Reliable

- Durable NRTL-certified NEMA type 3R enclosure
- Five-year limited warranty
- Two years labor reimbursement program coverage included for both the IQ Combiner SKU's
- UL listed



To learn more about Enphase offerings, visit enphase.com



Enphase IQ Combiner 4/4C

MODEL NUMBER

IQ Combiner 4 (X-IQ-AM1-240-4)	IQ Combiner 4 with Enphase IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes a silver solar shield to match the IQ Battery system and IQ System Controller 2 and to deflect heat.
IQ Combiner 4C (X-IQ-AM1-240-4C)	IQ Combiner 4C with Enphase IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes Enphase Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), a plug-and-play industrial-grade cell modem for systems up to 60 microinverters. (Available in the US, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area.) Includes a silver solar shield to match the IQ Battery and IQ System Controller and to deflect heat.

ACCESSORIES AND REPLACEMENT PARTS (not included, order separately)

Ensemble Communications Kit COMMS-CELLMODEM-M1-06 CELLMODEM-M1-06-SP-05 CELLMODEM-M1-06-AT-05	- Includes COMMS-KIT-01 and CELLMODEM-M1-06-SP-05 with 5-year Sprint data plan for Ensemble sites - 4G based LTE-M1 cellular modem with 5-year Sprint data plan - 4G based LTE-M1 cellular modem with 5-year AT&T data plan
Circuit Breakers BRK-10A-2-240V BRK-15A-2-240V BRK-20A-2P-240V BRK-15A-2P-240V-B BRK-20A-2P-240V-B	Supports Eaton BR210, BR215, BR220, BR230, BR240, BR250, and BR260 circuit breakers. Circuit breaker, 2 pole, 10A, Eaton BR210 Circuit breaker, 2 pole, 15A, Eaton BR215 Circuit breaker, 2 pole, 20A, Eaton BR220 Circuit breaker, 2 pole, 15A, Eaton BR215B with hold down kit support Circuit breaker, 2 pole, 20A, Eaton BR220B with hold down kit support
EPLC-01	Power line carrier (communication bridge pair), quantity - one pair
XA-SOLARSHIELD-ES	Replacement solar shield for IQ Combiner 4/4C
XA-PLUG-120-3	Accessory receptacle for Power Line Carrier in IQ Combiner 4/4C (required for EPLC-01)
XA-ENV-PCBA-3	Replacement IQ Gateway printed circuit board (PCB) for Combiner 4/4C
X-IQ-NA-HD-125A	Hold down kit for Eaton circuit breaker with screws.

ELECTRICAL SPECIFICATIONS

Rating	Continuous duty
System voltage	120/240 VAC, 60 Hz
Eaton BR series busbar rating	125 A
Max. continuous current rating	65 A
Max. continuous current rating (input from PV/storage)	64 A
Max. fuse/circuit rating (output)	90 A
Branch circuits (solar and/or storage)	Up to four 2-pole Eaton BR series Distributed Generation (DG) breakers only (not included)
Max. total branch circuit breaker rating (input)	80A of distributed generation / 95A with IQ Gateway breaker included
IQ Gateway breaker	10A or 15A rating GE/Siemens/Eaton included
Production metering CT	200 A solid core pre-installed and wired to IQ Gateway
Consumption monitoring CT (CT-200-SPLIT)	A pair of 200 A split core current transformers

MECHANICAL DATA

Dimensions (WxHxD)	37.5 x 49.5 x 16.8 cm (14.75" x 19.5" x 6.63"). Height is 21.06" (53.5 cm) with mounting brackets.
Weight	7.5 kg (16.5 lbs)
Ambient temperature range	-40° C to +46° C (-40° to 115° F)
Cooling	Natural convection, plus heat shield
Enclosure environmental rating	Outdoor, NRTL-certified, NEMA type 3R, polycarbonate construction
Wire sizes	• 20 A to 50 A breaker inputs: 14 to 4 AWG copper conductors • 60 A breaker branch input: 4 to 1/0 AWG copper conductors • Main lug combined output: 10 to 2/0 AWG copper conductors • Neutral and ground: 14 to 1/0 copper conductors Always follow local code requirements for conductor sizing.
Altitude	Up to 3000 meters (9,842 feet)

INTERNET CONNECTION OPTIONS

Integrated Wi-Fi	802.11b/g/n
Cellular	CELLMODEM-M1-06-SP-05, CELLMODEM-M1-06-AT-05 (4G based LTE-M1 cellular modem). Note that an Enphase Mobile Connect cellular modem is required for all Ensemble installations.
Ethernet	Optional, 802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included)

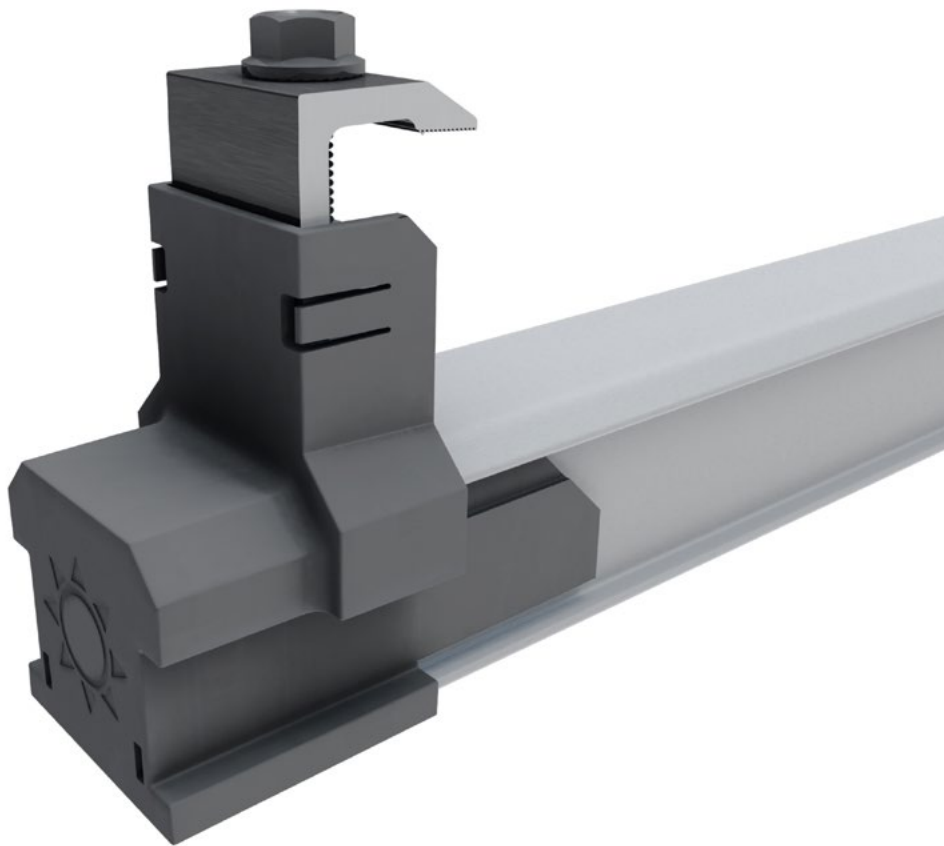
COMPLIANCE

Compliance, IQ Combiner	UL 1741, CAN/CSA C22.2 No. 107.1, 47 CFR, Part 15, Class B, ICES 003 Production metering: ANSI C12.20 accuracy class 0.5 (PV production) Consumption metering: accuracy class 2.5
Compliance, IQ Gateway	UL 60601-1/CANCSA 22.2 No. 61010-1

To learn more about Enphase offerings, visit enphase.com

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CLICKFIT®

COMPLETE RAIL-BASED RACKING SYSTEM

ClickFit is one of the fastest installing rail-based systems in the industry. Thanks to its Click-In rail assembly, the rails can be connected to any of EcoFasten's composition shingle, tile, and standing seam metal roof mounts in seconds without the need for fasteners or tools. The ClickFit system is made of robust materials and coated steel, to ensure corrosion-resistance and longevity. ClickFit conforms to UL 2703 and has been tested in extreme weather conditions including wind, fire, and snow.

FEATURES & BENEFITS

- Pre-installed rail fastening bolt
- Fully integrated bonding
- Click-On Mid & End Clamps
- Compatible with a variety of EcoFasten roof attachments
- Florida Product Approved for composition shingle roofs

FAST INSTALLING SYSTEM FEATURING CLICK-IN RAIL ASSEMBLY



**Composition Shingle,
Tile & Standing
Seam Metal**



Rail-Based



**Structural-Attach
Direct-Attach**





INTERNAL SPLICE

Tool-free bonded Internal Splice installs in seconds.

EBOS ACCESSORIES

Secure Module Level Power Electronics to the top of the rail using the ClickFit MLPE Mount. PV wires can be managed using the ClickFit Wire Clip and the ClickFit Wire Management Clamp.

[Additional eBoS accessories are available.](#)



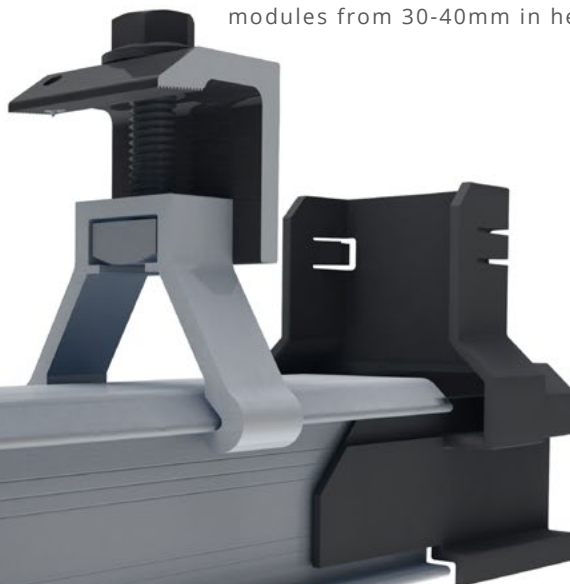
MID CLAMP

Click-on Mid Clamp features integrated bonding pins and fits module frames from 30-50 mm in height.



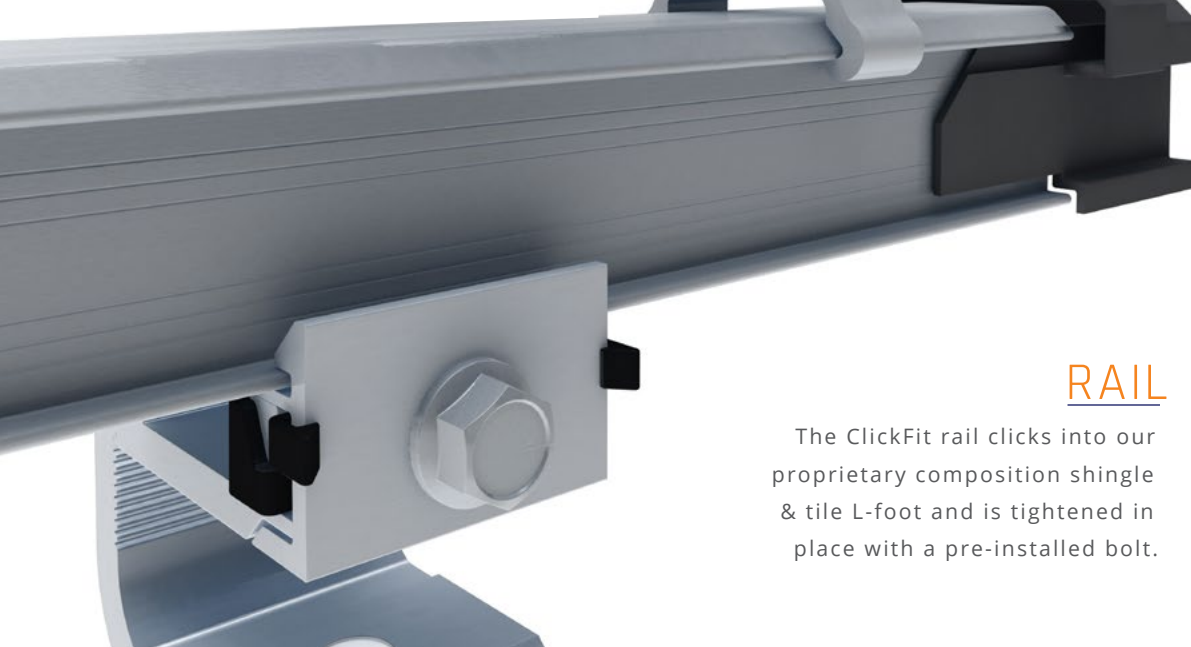
END CLAMP

One Click-on End Clamp fits modules from 30-40mm in height.



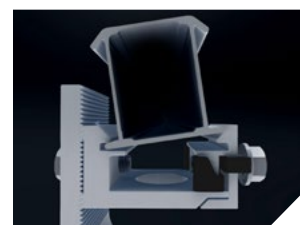
END CAP

Slide-on End Cap provide an aesthetic finish and allow for End Clamps to be accurately positioned on the rail in seconds.



RAIL

The ClickFit rail clicks into our proprietary composition shingle & tile L-foot and is tightened in place with a pre-installed bolt.

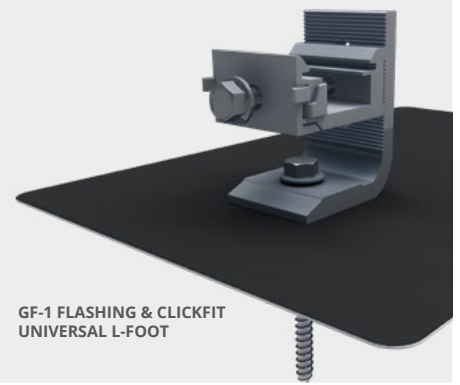


COMPOSITION SHINGLE ROOFS



L-FOOT WITH GF-1

Combine the versatile ClickFit Universal L-Foot with the watertight GF-1 flashing for a fast installation on composition shingle roofs.



SMART FOOT

Smart Foot can be attached directly to composition shingle roofs without a metal flashing. The integrated flashing utilizes our proprietary **UltraGrip Technology™**, creating a watertight seal.



CLICKFIT SMART FOOT





ECOFASTEN

EcoFasten has established a reputation for being one of the industry's leading innovators by providing expert solutions for mounting solar PV on any type of roof. Our broad portfolio of solutions stem from the needs of, and direct inputs by solar PV installers. We take pride in providing the right solution for every application. We educate our customers, so they purchase the best, most cost-effective solutions to fit their needs, and we complement that with on-site installation training to ensure 100% satisfaction. We are honest with ourselves, our customers and our employees, fostering a culture of idea-sharing, innovation and creativity.



[VIEW THE COMPLETE PARTS LIST](#)

ION DEVELOPER, LLC
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888.781.7074

T G Poppino
720 11th street oregon city, Oregon 97045
Project Auto Number: 00C1DL

ION Owned QTY	Consignment QTY	Quantity	ION SKU	Part Number	Description
		9	005-002-001-006	SIL-420-HC+	Silfab Solar SIL-420 HC+ mono PERC PV Module
		9	003-001-002-008	Enphase IQ8PLUS-72-2-US	Enphase IQ8PLUS-72-2-US Inverter
		2	003-001-002-013	Q-CONN-10M	Enphase Q-CONN-10M Male Field-Wireable Connector
		1	001-001-008-007	BR215	EATON 15A/2P Breaker, Plug-In, 2 Space
		26	006-001-003-017	1500004	EcoFasten ClickFit L-Foot
		5	006-001-003-016	1500035	EcoFasten CF Rail 4202MM (abt 13.8 FT)
		25	001-001-012-001	S6445	Heyco S6445 Sunrunner Clip
		2	001-001-003-024	1500028	EcoFasten Module Jumper Bonding Attachment

